HIGH ALTITUDE RECONNAISSANCE SYSTEM

At the present time there are two methods being used for gathering strategic reconnaissance data; (1) Satellite Reconnaissance, i.e., Samos, (2) Manned high altitude aircraft, i.e., U-2.

The Samos system is unproven, has inherent reliability problems because of the high complexity of the system, lacks operational flexibility, and apparently assumes that counter measures do not exist.

The U-2 system is seriously limited in its usefulness, not alone because of vehicle limitations but, additionally, because the photographic system is no longer up to the state of the art.

This report advances the concept of a manned reconnaissance vehicle with a capability for flying at altitudes between 80,000 and [redacted] STAT at speeds up to Mach 3. The primary sensor would be a high acuity camera system designed for high reliability and large ground coverage.

The camera system for this vehicle is outlined in some detail in pages 200 to 22[illegible] of the Technical Report. Basically, the camera is a logical extension of the 73B incorporating a number of new concepts, new state of the art components and the experience gained through five years association with the special project. The parameters of this camera system have been based on recent information from WADD and BMD as well as on informal recommendations of numerous associates in the special project from the users in the field to those who interpret the final material. Thus, these parameters represent a wealth of experience and expert opinion. Responsibility for the final selection of these parameters, after careful consideration of the necessary trade-offs, rests wholly with Hycon.

CAMERA PARAMETERS

Focal length:	48 inch refractor
Relative aperture:	f/5.6
Format:	18 x 18 inch
Half angle:	10.5 degrees
System resolution, on axis:	110 lines/millimeter (low contrast)
System resolution, 10.5° off axis:	90 lines/millimeter (low contrast)
Angular resolution:	8.1×10^{-6} radians for average 100 l/mm
Ground resolution for 120,000 feet:	W=0.49 foot at vertical W=0.98 foot at 60° oblique
Film types:	Thin base (SO-243, SO-213, SO-130)
Film load:	6,000 feet, thin base film (2 rls. 9½" wide)
Volume:	33 x 49 x 62 inches
Weight: Design goal	500 pounds
Shutter-focal plane:	1/60 to 1/250 second
Angular coverage:	140 degrees

MODE	ALTITUDE (FEET)	SIDE TO SIDE COVERAGE (N.MILES)	TOTAL FLIGHT LINE * (N.MILES)	TOTAL AREA COVERAGE * (SQUARE N.MILES)
7 POS.	[redacted]	114	1925	219,500
3 POS.		23.6	5150	121,000

* Based on 6000 foot film load and minimum 60% forward overlap of all frames.

To achieve these goals, the proposed camera system would employ stabilization and vibration isolation of the camera and all moving components. Both IMC and lateral viewing would be achieved through use of a scanning mirror mounted forward of the lens. Another mirror is used to fold the optical path and, therefore, the image is not reversed as in the 73B. Both pieces of film cross the platen traveling in the same direction which removes the viewing complexity and reduces the gap between the two pieces of film.

The proven simplicity of the 73B design has been retained in this proposed camera system in order to maintain high reliability. In addition, the present ground support equipment developed for the 73B system would be compatible with the 244 camera.

Temperature stability would be achieved through control of the camera bay temperature using a system of baffles to direct the air for maximum cooling effectiveness and to minimize turbulence in the optical path.

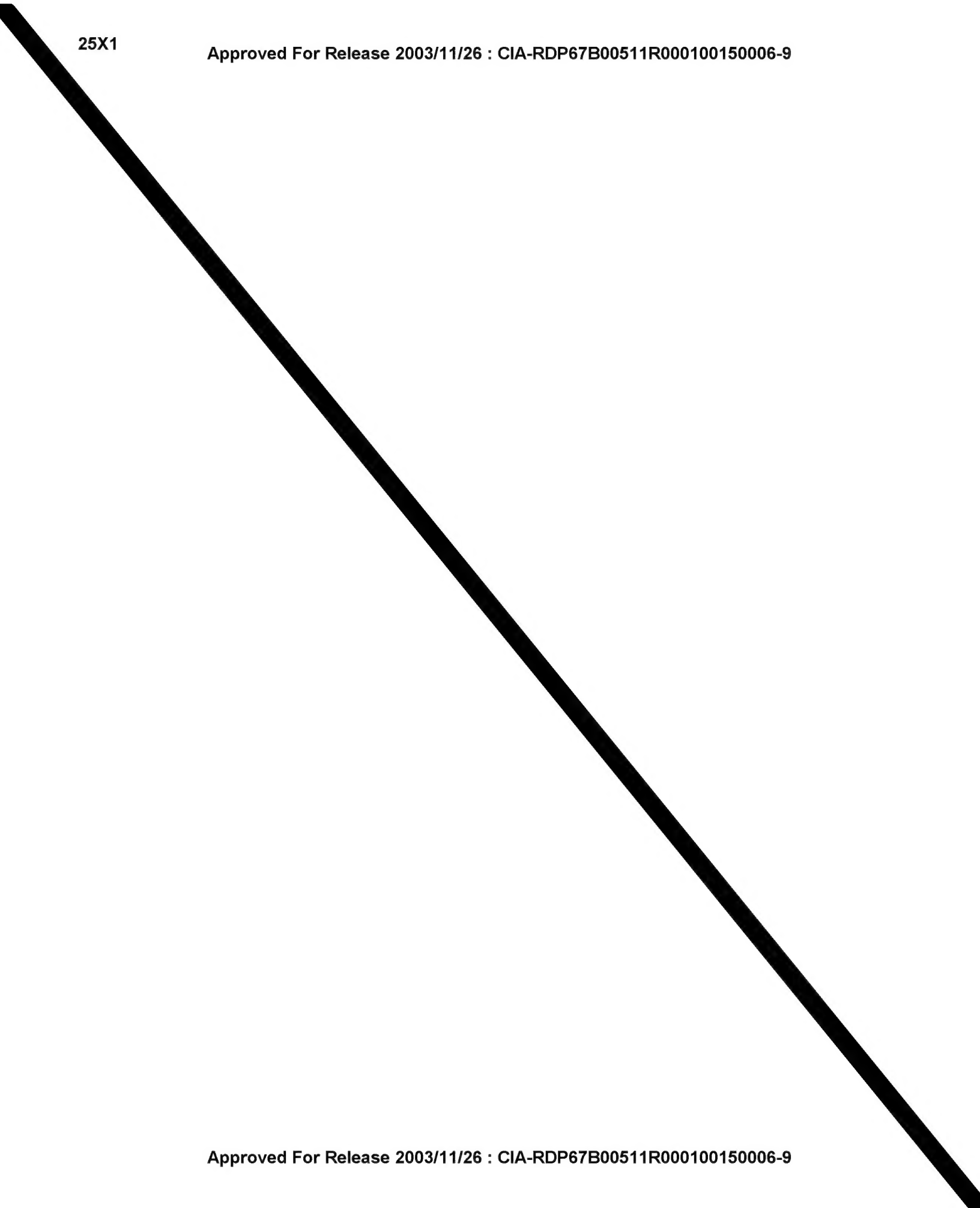
Another environmental problem results from the presence of a shock wave - however, wind tunnel tests have indicated that the shock wave should not reduce the resolution but will produce only an image shift due to refraction.

COMPARISON OF STRATEGIC RECONNAISSANCE SYSTEMS

	73B	E-5	E-6	244
Ground Resolution at vertical	W=1.5 feet	W=2.5	W=5	W=0.5 @ 120,000'
Ground Resolution at 60°	W=3			W=1 @ 120,000'
Resolution at focal plane On axis	54 l/mm	130 l/mm	120 l/mm	110 l/mm
Mission coverage square N. miles	924,300		9,000,000 sq. mi.(requirement)	219,500 7 pos.
Mission coverage flight line	1640			1,925 7 pos.
Angular coverage	174°	4° x 20°		140°
Format	18" x 18"	4½" x 23"	2½" x Panoramic estimate	18" x 18"
Weight	500#	Over 1000#		Design goal 500#
Volume	33 x 49 x 50	72" dia. estimate		33 x 49 x 62
Film load	Thin base 9,000 feet 2 rolls			Thin base, 2 rolls 9,000 feet
Focal length	36"	66"	36"	48"

In the table above it is important to note that the 244 camera performance is based upon using SO-213 emulsion which requires no special techniques for processing. It is believed that the E-5 and E-6 systems require the use of SO-243 emulsion plus special processing.

In addition, the 244 system provides a means of obtaining ground resolutions five times better than the best satellite system. The necessity for obtaining detailed information is certainly more vital now than ever before. Thus the proposed system is complimentary to the satellite reconnaissance program.



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